Project Capsule

24-2ST

August 2024

Redesign of Innovative Gate Arms (Ramp Closure Gate) - Phase I

PROBLEM

The Louisiana Department of Transportation and Development (DOTD) uses a cost-effective, portable swinging gate arm that can be easily deployed and installed as a ramp closure gate. Since the hardware is in place even when the ramp is open, its crashworthiness must be evaluated as a roadside device. DOTD funded Project LTRC 22-1ST to investigate the crashworthiness performance under the Manual for Assessing Safety Hardware (MASH) criteria on support structures.

In LTRC Project 22-1ST, the ramp closure gate was evaluated under MASH Test Level 3 (TL-3) impact conditions using finite element (FE) computer simulations. The FE simulations showed that the current design of the ramp closure gate did not meet MASH criteria. Therefore, a modified design of the ramp closure gate is needed to meet the crashworthiness standard required by MASH and be deployed effectively when a ramp closure is mandated.

Figure 1. DOTD Contraflow Ramp Closure Gate

OBJECTIVE

This project aims to redesign the existing ramp closure gate used by Louisiana DOTD. The research team will utilize FE computer simulations and laboratory crash testing to develop a modified design that both passes MASH test protocols consistently and meets the functional requirements.

Start Date
July 1, 2024

Duration
15 months

Funding
SPR: TT-Fed/TT-Reg - 6

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METHODOLOGY

To achieve the objectives of this study, the research team will employ several methods. First, they will conduct a comprehensive literature review on all relevant studies and the current state of practice to help identify the design and crashworthiness of ramp closure gates. The team will then redesign the ramp closure gate for submission to the Project Review Committee (PRC). After receiving approval for the modified design, the team will submit the crashworthiness evaluation plan, using computer simulations and laboratory testing as part of the evaluation.

Following these tasks, the research team will draft a Technical Summary and Final Report detailing their findings. They will give a final presentation and provide revised documents based on comments received from the PRC.

IMPLEMENTATION POTENTIAL

This project will benefit DOTD by providing a redesigned ramp closure gate, evaluated with computer simulations and laboratory testing. The design may provide benefits for applications that require periodic or permanent ramp or road closures due to planned events, routine or recurring maintenance, emergency or incident management, or as a means to control merge points and traffic flow. The use of the gates should provide a more rapid and efficient means of ramp closure requiring less personnel and equipment, thereby potentially reducing costs and improving the safety of maintenance personnel. Engineering drawings will be provided for the recommended design of the ramp closure gate. Full-scale crash testing of the ramp closure gate design may be recommended as part of future research to verify the compliance of the system with MASH criteria prior to its widespread implementation or use as a standard detail.